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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re Patent Application of)
Mitsunori SAKAMA)
Serial No. 09/070,908)
Filed: May 4, 1998)
For: FILM FORMING METHOD AND)
FILM FORMING APPARATUS)

Art Unit: 1762
Examiner: M. Padgett

CERTIFICATE OF MAILING

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Washington, D.C. 20231, on 4-28-03

Adele M. Stamper
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AFTER FINAL RESPONSE

Honorable Commissioner of Patents
Washington, D.C. 20231

Sir:

The Official Action mailed November 27, 2002 has been received and its contents carefully noted. Filed concurrently herewith is a *Request for Two Month Extension of Time* which extends the shortened statutory period for response to April 27, 2003. Accordingly, the Applicant respectfully submits that this response is being timely filed.

The Applicant notes with appreciation the consideration of the Information Disclosure Statement filed on February 12, 2002.

Claims 23-29, 31-50 and 58-129 are pending in the present application, of which claims 23-29, 58, 64, 70, 76, 82, 87, 92 and 98 are independent. For the reasons set forth in detail below, these claims are believed to be in condition for allowance.

The present invention relates to a film forming method for fabricating a thin film transistor. Features of the present invention are shown by a timing chart such as in Fig. 7. In forming a film such as a semiconductor film by a plasma CVD method, a discharge gas such as hydrogen gas is supplied into a chamber to cause radio frequency discharge. When the radio frequency discharge becomes stable, a reactive gas such as silane gas is supplied into the chamber at the same flow rate as the supply of the discharge gas to form the semiconductor film by decomposing the reactive gas, and the supply of the discharge gas is stopped during the film formation. Further, an

overall flow rate of gases supplied in the chamber is maintained during a transition from the discharge gas to the reactive gas. As a result, it is possible to eliminate an instability at a start of the radio frequency discharge, and the film formation can be carried out in the state where the radio frequency discharge is always stable.

Also, in finishing the film formation, the supply of the reactive gas is stopped in the state where the radio frequency discharge is maintained, and a discharge gas is supplied into the chamber at the same flow rate as the reactive gas. Further, an overall flow rate of gases supplied in the chamber is maintained during a transition from the reactive gas to the discharge gas. For a predetermined period of time, plasma without the film formation is maintained in the chamber. Also, the radio frequency discharge is stopped in the state where minute particles in the chamber are exhausted. In this way, the state where the minute particles do not adhere to the formed surface can be made.

Paragraph 3 of the Official Action rejects claims 23-29, 45-50, 58, 59, 61-65, 67-82, 84-87, 89-104, 106-110 and 113-129 as obvious based on the combination of Kozuka, Gupta '843 and U.S. Patent No. 5,456,796 to Gupta et al. The Applicants respectfully traverse the rejection because the Official Action has not made a *prima facie* case of obviousness.

As stated in MPEP §§ 2143-2143.01, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art." *In re Kotzab*, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000). See also *In re Fine*, 837 F.2d 1071, 5

USPQ2d 1596 (Fed. Cir. 1988); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

The prior art, either alone or in combination, does not teach or suggest all the features of the independent claims. Kozuka discloses that the raw material gas is preferably used not singly but as a mixture with a diluting gas during the film formation (see col. 4, lines 40-42). On the other hand, as previously submitted by the Applicant, the claimed invention has a feature that the discharge gas is not mixed with the reactive gas as can be seen in all the independent claims. The Official Action asserts that the prior art teaches that a reactant gas "may or may not" be mixed with a diluting gas (p. 3, Paper No. 37). The Official Action cites col. 5, lines 31-50 and col. 6, lines 61-68 of Gupta '796 and col. 5, lines 5-15 of Gupta '843 to support this assertion. However, it is not at all clear how the combined prior art supports this assertion. At best, Gupta '796 and Gupta '843 suggest that the flow of an inert gas may be stopped and the flow of a process gas may be started. This is not the same as the present invention which includes a feature that the discharge gas is not mixed with the reactive gas. In any event, by teaching that it is preferable to use a mixture of a diluting gas and a reactant gas, Kozuka teaches away from the present invention. This is the case even if the diluting gas of Kozuka is equivalent to the discharge gas of the present invention.

As previously submitted, the independent claims recite that an overall flow rate of gases supplied in the chamber is maintained during a transition from the discharge gas to the reactive gas or from the reactive gas to the discharge gas. This feature is supported by the timing chart of Fig. 7 and in the fourth paragraph on p. 19 of the specification. Further, this feature contributes in preventing the change of pressure in the atmosphere at the time when the supply of the hydrogen gas is converted to the supply of the silane gas as described in the fifth paragraph on p. 19.

Kozuka may teach that a pressure of the I-layer forming chamber 104 is made the same as that of the N-layer forming chamber 103 from col. 5, line 66 to col. 6, line 1. However, it should be noted that the above disclosure has nothing to do with maintaining the pressure during a transition from the discharge gas to the reactive gas or from the reactive gas to the discharge gas. Also, it appears that Kozuka fails to teach that the overall flow rate of gases supplied in the chamber is maintained during the

above-referenced transition. Therefore, the Applicant respectfully submits that Kozuka, either alone or in combination with any of the cited prior art, does not teach or suggest that an overall flow rate of gases supplied in the chamber is maintained during a transition from the discharge gas to the reactive gas or from the reactive gas to the discharge gas.

The Official Action contends that Gupta '843 "would suggest to the competent workmen that one not create discontinuities in the flow rate at the gas change over (transition), which is consistent with maintaining the pressure throughout the process in Kozuka" (p. 4, Paper No. 37, citing Gupta '843 at col. 2, lines 54-58, etc.). However, Gupta '843 does not specifically mention a "change over" or a "transition" between the two gas inputs. The prior art is silent about the claimed gas flow rate during the transition period and does not appear to recognize the importance of maintaining an overall flow rate of gases supplied in a chamber during a transition from the discharge gas to the reactive gas or from the reactive gas to the discharge gas. As such, the Applicant respectfully submits that Gupta '843 is not appropriate to support the above modification of Kozuka.

Since Kozuka, Gupta '843 and Gupta '796, whether taken alone or in combination, do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) is in order and respectfully requested.

Paragraphs 4 and 5 of the Official Action reject claims 60, 66, 83 and 88 and claims 31-44, respectively, as obvious based on the combination of Kozuka, Gupta '843, Gupta '796, U.S. Patent No. 5,366,926 to Mei et al., U.S. Patent No. 5,346,850 to Kaschmitter et al. and/or U.S. Patent No. 5,313,850 to Yamazaki et al. Please incorporate the arguments above with respect to the deficiencies in Kozuka, Gupta '843 and Gupta '796. Mei, Kaschmitter and Yamazaki '850 do not cure the deficiencies in Kozuka, Gupta '843 and Gupta '796. The Official Action relies on Mei, Kaschmitter and Yamazaki '850 to teach the use of silicon oxide layers and crystallization using laser light (p. 8, Paper No. 30). The prior art, either alone or in combination, does not teach or disclose that the discharge gas is not mixed with the reactive gas or that an overall flow rate of gases supplied in the chamber is maintained during a transition from the

discharge gas to the reactive gas or from the reactive gas to the discharge gas. Since Kozuka, Gupta '843, Gupta '796 and Mei, Kaschmitter and Yamazaki '850 do not teach or suggest all the claim limitations, a *prima facie* case of obviousness cannot be maintained. Accordingly, reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) is in order and respectfully requested.

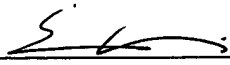
Paragraph 2 of the Official Action rejects claims 23-29, 45-50, 58-104, 106-110 and 113-129 under the doctrine of obviousness-type double patenting over the combination of either claims 1-63 of U.S. Patent No. 6,281,147 to Yamazaki et al., or claims 1-5, 12-21 and 27-30 of U.S. Patent No. 6,015,762 to Yamazaki et al., U.S. Patent No. 6,289,834 to Gupta et al. and, optionally, U.S. Patent No. 5,420,044 to Kozuka. As stated in MPEP § 804, under the heading "Obviousness-Type," in order to form an obviousness-type double patenting rejection, a claim in the present application must define an invention that is merely an obvious variation of an invention claimed in the prior art patent, and the claimed subject matter must not be patentably distinct from the subject matter claimed in a commonly owned patent. Also, the patent principally underlying the double patenting rejection is not considered prior art.

The Applicants respectfully traverse the obviousness-type double patenting rejection because independent claims 23-29, 58, 64, 70, 76, 82, 87, 92 and 98 of the present invention are patentably distinct from the claims of either Yamazaki '147 or Yamazaki '762. Specifically, the independent claims of the present invention recite that an overall flow rate of gases supplied in a chamber is maintained during a transition from the discharge gas to the reactive gas or from the reactive gas to the discharge gas. Yamazaki '147, Yamazaki '762, Gupta '843 and, optionally, Kozuka do not claim or disclose at least the above-referenced feature of the present invention. The Applicants respectfully submit that the present application is patentably distinct from the combination of either Yamazaki '147 or Yamazaki '762 with Gupta '843 and, optionally, Kozuka. Reconsideration of the obviousness-type double patenting rejection is requested.

Applicants note that dependent claims 105, 111 and 112 have not been formally rejected. It is respectfully submitted that claims 105, 111 and 112 are allowable.

Should the Examiner believe that anything further would be desirable to place this application in better condition for allowance, the Examiner is invited to contact the Applicant's undersigned attorney at the telephone number listed below.

Respectfully submitted,



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